

## Terrestrial isopod crustaceans (Oniscidea) from Paraguay with definition of a new family

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**Terrestrial isopod crustaceans (Oniscidea) from Paraguay with definition of a new family.** – The Oniscidea from Paraguay are reviewed. New taxa are *Paraguascia pigmentata* n. gen. n. sp., *Alboscia elongata* n. gen. n. sp., *Novamundoniscus* n. gen. (for *Phalloniscus vandeli* Lemos de Castro). Dubioniscidae n. fam. (proposed for *Calycuoniscus*, *Dubioniscus* and *Novamundoniscus* n. gen.). Characters of examined previously described taxa are discussed, detailed redescriptions are given for *Dubioniscus delamarei* and *Trichorhina brasiliensis*. *Circoniscus* is briefly reviewed along with a record of *C. bezzii* from Paraguay. *Venezillo bolivianus* is briefly redescribed. Fifteen species of terrestrial Oniscidea are recorded from Paraguay, four of which are cosmopolitan. *Trichorhina heterophthalma* is recorded for the first time from Paraguay.

**Key-words:** Oniscidea - Dubioniscidae n. fam. - *Phalloniscus* - Paraguay.

### INTRODUCTION

Terrestrial isopods were first recorded from Paraguay by DOLLFUS (1894) who discussed five species including two new ones. Subsequently he gave (1897) additional information on Paraguayan and some other species from Argentina and Bolivia. As the Chaco region was in dispute between Paraguay and Bolivia at this time, some of Dollfus's records might be from present day Bolivia. VAN NAME (1936) described *Philoscia paraguayana* from Paraguay and gave short notes on species described by Dollfus. ANDERSSON (1960) added a further oniscidean species to the fauna of Paraguay and discussed a few others. VANDEL (1963) transferred *P. paraguayana* to *Balloniscus* because all five pairs of exopods of the pleopods contain pseudotrachea. In the absence of new material of *Balloniscus paraguayanus*, *B. sellowi* and of *Benthana picta*, the discussion below are based only on facts from the literature.

*Dubioniscus delamarei*, described by VANDEL (1963) from Argentina, was collected in Paraguay. It is made the basis of a new family. *Phalloniscus vandeli* Lemos de Castro from Brazil was reencountered and redescribed. The species is represent here at most of the stations sampled and by most of the specimens. It and

other members of *Phalloniscus* from the New World are placed in a new genus here. *Phalloniscus*, *Calycuoniscus* and *Dubioniscus* have been variously placed in Bathytropidae, Oniscidae or Platyarthridae, but here *Dubioniscus*, *Calycuoniscus* and the new genus defined here are placed in a new family based on *Dubioniscus*. The anophthalmic, now known to be common, species of *Trichorhina brasiliensis*, is redescribed. A recent summary of the species in *Circoniscus* briefly is reviewed and *C. bezzii* is recorded at one station in Paraguay. Three species of Armadillidae, including the common *Cubaris murina* and two, one new, species of *Venezillo* are discussed.

Three tiny specimens of Trichoniscidae (Buddelundiellinae, perhaps in *Buchnerillo*) were collected 80 km S Bella Vista (Amambay prov. sifting of forest litter. 1.XI.1979), but they were too small (almost 1 mm long, one damaged) to be identified further or discussed here. Four species of common oniscideans which are cosmopolitan in distribution were collected in Paraguay, their ranges now formally include Paraguay: *Cubaris murina*, *Porcellionides pruinosus*, *Porcellio laevis* and *Trichorhina heterophthalma*. It is of interest to note that *Cubaris murina* and *Trichorhina heterophthalma* generally are recorded to be widespread in subtropical and tropical habitats, whereas *Porcellio laevis* is more abundant in temperate habitats. *Porcellionides pruinosus* has been recorded in tropical, subtropical and temperate habitats, and perhaps is the most widely distributed oniscidean in the world. All 15 named Oniscidea from Paraguay are recorded in their respective family in Table 1.

Two of the four expansive and/or cosmopolitan species recorded are discussed briefly below in their respective family. The two other species belonging to Porcellionidae are in *Porcellio laevis* recorded by DOLLFUS (1894) from Tresistencia, Chaco, and Asuncion, and *Porcellionides pruinosus* recorded as a *Metoponorthus* by DOLLFUS (loc. cit.) from Buenos Aires, Argentina, and Villarrica and Asuncion, Paraguay. They were cited by ANDERSSON (1960) and VANDEL (1962a).

## MATERIAL

All oniscideans described and discussed here were collected during the Zoological Expeditions to Paraguay carried out by the staff of the Muséum d'histoire naturelle in 1979 and 1982. The type specimens of the new species and other specimens described or redescribed here are deposited in the museum (MHNG). Example specimens of several species (see individual accounts) have been donated to the National Museum of Natural History (Smithsonian Institution) (USNM), and the Natural History Museum London (BMNH). Lemos de Castro deposited his specimens in the Museo Nacional, Rio de Janeiro (MNRJ).

## PHILOSOCIIDAE

In his comprehensive work on the Oniscidea of France, VANDEL (1962a:503) defined Philosciinae which he included as a subfamily in Oniscidae. Philosciinae later was raised to family, but Vandel's definition still is the best of the taxon to date.

TABLE 1

All 15 Named Oniscidea Recorded from Paraguay  
(with family placement)

## Cosmopolitan Species

- Cubaris nurina* (Brandt, 1833) (Armadillidae) (not collected)  
*Porcellio laevis* Latreille, 1804 (Porcellionidae) (not collected)  
*Porcellionides pruinosus* (Brandt, 1833) (Porcellionidae) (not collected)  
*Trichorhina heterophthalma* Lemos de Castro, 1964 (Platyarthridae)

## Endemic Species

- Alboscia elongata* n. gen. n. sp. (Philosciidae)  
*Balloniscus paraguayanus* (Van Name, 1936) (Balloniscidae) (not collected)  
*Balloniscus sellowii* (Brandt, 1833) (Balloniscidae) (not collected)  
*Benthana picta* (Brandt, 1833) (Philosciidae) (not collected)  
*Dubioniscus delamarei* Vandel, 1963 (Dubioniscidae n. fam.)  
*Circoniscus bezzii* Arcangeli, 1931 (Scleropactidae)  
*Novamundoniscus* n. gen. *vandeli* (Lemos de Castro, 1959) (Dubioniscidae n. fam.)  
*Paraguascia pigmentata* n. gen. n. sp. (Philosciidae)  
*Trichorhina brasiliensis* Andresson, 1960 (Platyarthridae)  
*Venezillo bellavistanus* n. sp. (Armadillidae)  
*Venezillo bolivianus* (Dollfus, 1897) (Armadillidae)

(Three tiny, damaged specimens of Trichoniscidae, perhaps *Buchmerillo* of Buddelundiellinae, were collected but not described.)

*Benthana picta*, redescribed by GRUNER (1955), was recorded from Villarrica, Paraguay, by ANDERSSON (1960:559). The two new species of Philosciidae collected in Paraguay differ morphologically. One has large eyes and a shiny, darkly pigmented dorsum; the other has small eyes and a shiny, pigmentless dorsum. All definitions of genera and unresolved, poor descriptions of philosciids from the New World were examined and comparisons were made with the specimens described here. No species or genus of Philosciidae recorded from the New World conforms in character presence or absence to the two new species so each was placed in a separate genus. Since many species of Philosciidae from the New World have been so poorly described any many are to be described in the future, some important characters to be used for describing species and defining genera of philosciids are as follows:

- Absence or presence and number of ocelli
- Size of anterolateral lobes on cephalon
- Absence or presence and type of frontal and supra-antennal lines
- Dorsum with or without small scales
- Absence, presence or degree of body pigment
- Pattern and number of aesthetascs on antenna 1
- Absence or presence and pattern of lateral nodes and glands on pereons
- Mandibular type and setation, especially type of setation on molar (single, few, compounds), number in setal row and on lacinia mobilis

- Type and number of teeth on exopod of maxilla 1
- Absence or presence of penicillate setae on blade of maxilliped
- Type of grooming organ on pereopod I (and II) of male and female
- Width of pleon compared to width of pereon
- Type and length of neopleurons on pleonal segments
- Absence or presence and type and number of pseudotracheae on exopods of pleopods
- Shape of uropods including whether rami come off at same or different level
- Shape, especially posterior margin, of pleotelson.

### **Paraguascia** n. gen.

DIAGNOSIS. Eyed. Supra-antennal line well developed. Pigmented dorsum smooth. Lateral nodes present. Molar of mandible compound. No penicillate setae on blade of maxilliped. Pereopods I of male and female with conspicuous grooming organs. Two spots on outer surface of basis of pereopods collectively appear as two darkened lines in ventral view of specimen. Pleon abruptly narrower than pereon; neopleurons of segments 4 to 5 closely appressed laterally. Pseudotracheae absent. Rami of uropods arise at same level.

TYPE SPECIES. *Paraguascia pigmentata* n. sp. Type by original designation.  
Gender. Feminine.

TAXONOMIC REMARKS. The new genus is near to *Prosekia* Vandel (1968), but that genus is composed of a diverse set of eight species (see LEMOS DE CASTRO & SOUZA, 1989). The new genus differs from the type of *Prosekia*, *P. galapagensis*, in that it has few aesthetascs on antenna 1, a compound molar on the mandible, no penicillate seta on the maxilliped and the rami of the uropods arise at the same level. The general shape of the palp of the maxilliped (two bundles of setae on article 2 arise directly from the edge; they are not mounted on extensions of the edge) is different when compared to the shape of the palp recorded for other species of *Prosekia*. According to the criteria listed above for Philosciidae, when the species of *Prosekia* are reexamined representative of several genera will be revealed.

### **Paraguascia pigmentata** n. sp.

Figs 1A-L and 2A-S

DESCRIPTION. About 12 ocelli. Body about twice as long as broad. Dorsum smooth, shiny and variegated dark brown. Lateral nodes each with long seta visible on edges of pereons I to III and V to VII (Fig. 1A). Glands on pereons not apparent. Cephalon set in front of pereon I; anterolateral lobes small; distinct frontal and supra-antennal lines. Antenna 1 with four long aesthetascs two in first tier and two apically placed. Antenna 2 extending back about to posterior edge of pereon III; flagellum longer than



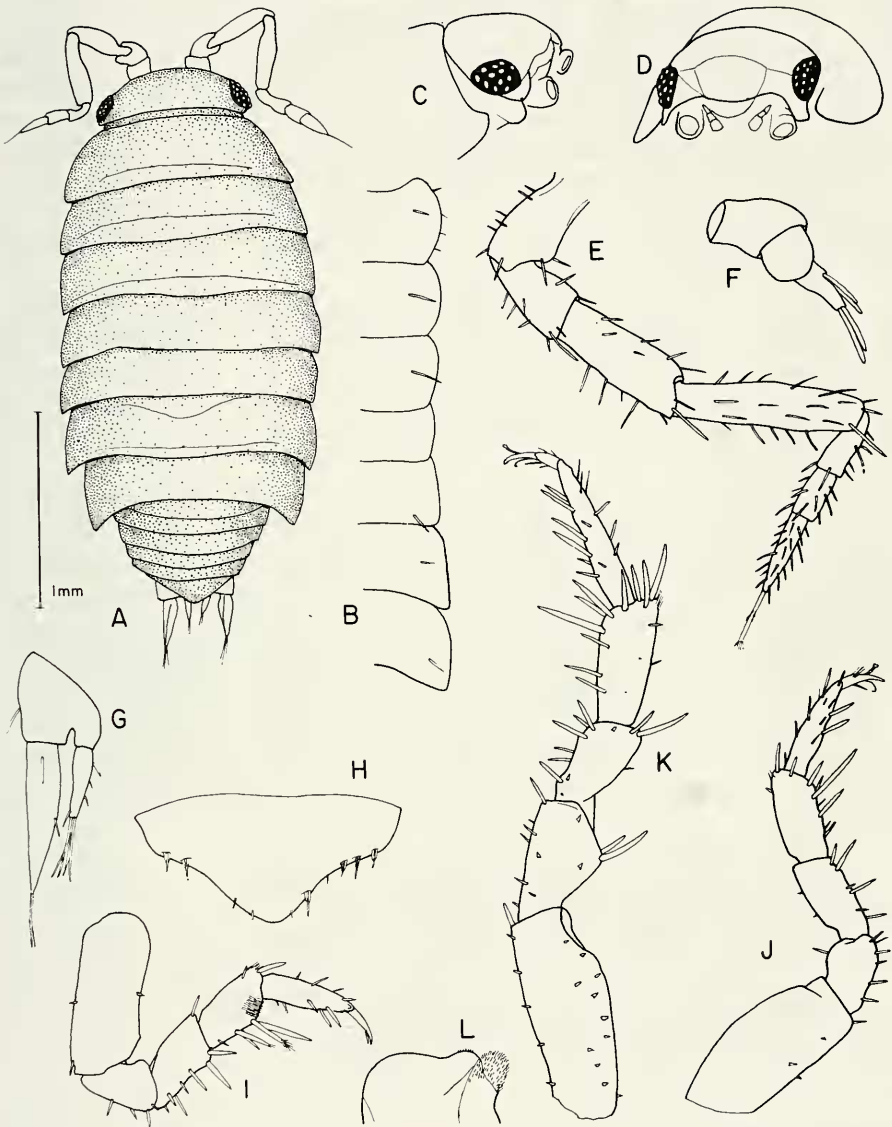


FIG. 1

*Paraguascia pigmentata* n. gen. n. sp.: A) dorsal view; B) detail, edges of pereopods; C) cephalon, lateral view; D) cephalon, frontal oblique view; E) antenna 2; F) antenna 1; G) uropod; H) pleotelson; I) male pereopod I; J) male pereopod II; K) male pereopod VI; L) tip maxilla 2.

peduncle segment 5, three articles subequal in length, apical article tipped with long seta.

Labrum rounded. Left and right mandibles with compound molar, one seta in setal row and one seta on lacinia mobilis. Exopod of maxilla 1 with four simple large outer teeth and four smaller inner bifurcate teeth; endopod with apex round and two subapically placed penicillate setae. Maxilla 2 with narrow, rounded sensory lobe projecting medially from square apex. Maxilliped with few setae on outer surface; blade lacks penicillate seta; basal segment of palp with large seta on inner margin and smaller seta laterally; inner margin of edge of second segment with two bunches of setae and apical segment with tuft of setae. Epipod about 2/3 length of maxilliped proper, apex rounded.

Pereon with convex lateral margins. All pereopods with long dactylar organ with knob on end. Grooming organ formed as propodus with two large setae distally on inner surface and very long setae on inner surface of carpus. Female pereopod I with few setae on inner surface of propodus; dactylus with grooming organ and with many elongate setae on inner surface; long distally placed setae on outer surface of dactylus and merus.

Pleon narrower than pereon; segment 1 with edges suppressed by pereon VII; segments 2 to 5 with neopleurons laterally appressed to pleon. Genital apophysis simple. Male pleopod 1 with exopod with medial edge only slightly produced, apex rounded; no marginal setae; endopod simple, produced and apex folded laterally. Male pleopod 2 with exopod moderately elongate, two marginal setae; endopod elongate, thin and pointed. Female pleopod with exopod tiny, medially produced, no marginal setae. Male pleopods 3 to 5 and female pleopods 2 to 5 simple with many marginal setae. Pleotelson with posterolateral margins excuvate, posterior margin rounded. Long rami of uropod exiting at same level, basis deeply notched between exit sites of rami; endopod about half as long as exopod; each tipped with few long setae.

Measurements. To about 4 mm long.

TYPE LOCALITY. Misiones prov. 30 km San Juan Bautista (road to San Ignacio) near Ao. Aguaray, sifting forest litter, 14.X.1982: 1 male (holotype).

DISTRIBUTION. Caaguazu prov., 20 km N Colonel Oviedo, sifting bamboo leaves, 7.X.1979, 2 paratypes females (females lost) during.

The sympatric *Novamundoniscus vandeli* can be distinguished by the presence of two lines of pigment on the basis of the pereopods.

Deposition of type and other specimens: MHNG.

### **Alboscia** n. gen.

DIAGNOSIS. Eyed. Frontal line absent. Supra-antennal line present. Pigmentless, shiny body markedly narrower than long. Conspicuous lateral nodes present. Pleon slightly narrower than pereon. Pleonal segment 1 and part of segment 2 enclosed within broadly curved posterior margin of pereon VII; neopleurons of 2 to 5 closely appressed to pleon. Molar of mandibles compound. No penicillate setae on blade of



FIG. 2

*Paraguascia pigmentata* n. gen. n. sp.: A) male pereopod VII; B) male pleopod 1; C) male pleopod 2; D) male pleopod 3; E) male pleopod 4; F) male pleopod 5; G) detail maxilliped; H) left mandible; I) right mandible; J) female pereopod I; K) female pereopod II; L) female pereopod VI; M) female pereopod VII; N) female pleopod 1; O) female pleopod 2; P) female pleopod 3; Q) female pleopod 4; R) female pleopod 5; S) maxilla 1.

appressed to pleon. Molar of mandibles compound. No penicillate setae on blade of maxilliped.

TYPE SPECIES. *Alboscia elongata* n. sp. Type by original designation.

Gender. Feminine.

TAXONOMIC REMARKS. Species of several genera of Philosciidae from caves lack ocelli and all body pigment. Other philosciids, mainly from dense leaf litter or loose soil, have a reduced number of ocelli and little or no body pigment. The combed teeth on the exopod of maxilla 1 suggest that the new genus is related to *Benthana*. However, in addition to the combed teeth, all species of *Benthana* have many ocelli and are well pigmented, among other differences (see GRUNER, 1955).

***Alboscia elongata* n. sp.**

Figs 3A-J and 4A-T

DESCRIPTION. One ocellus (lens) apparent, but pigment pattern looks like three merged ocelli. Body about 3.25 times as long as broad. Cephalon set in front of pereon I. Dorsum smooth, shiny, without body pigment, but with some marginal setae on posterior borders of pleonal segments. Frontal margin of cephalon (dorsal view) slightly produced, anterolateral lobes moderately large, directed ventrally. Frontal line absent. Supra-antennal line well defined. Antenna 1 with apical article ending in large scale-like point with at least five aesthetascs in lower tier and two apically placed. Antenna 2 long and thin, if extended posteriorwardly it reaches about to posterior edge of pereon V. Flagellum of three articles about length of peduncular segment 5; middle article about half as long as articles 1 and 3. Article 3 tipped with long seta.

Labrum rounded. Left mandible with compound molar, one seta in setal row and many setae on molar. Right mandible with compound molar, one seta in setal row and no molar setae. Maxilla 1 with exopod with five outer plain teeth; four inner teeth combed; endopod apically rounded with two subapical penicillate setae. Maxilla 2 with inner sensory lobe about half width of rounded apex. Maxilliped with few scaled setae on outer surface; blade with one seta on outer margin and two triangulate scales on curved margin. Palp of maxilliped with two long setae on basal segment; segment 2 with two large setae close together on upper part of rounded inner margin; apical segment narrow, conical and about as long as both long setae on segment 2, apex tipped with several long setae. Epipod of maxilliped about 2/3 length of maxilliped proper, apically rounded.

Pereon with shiny surface, lateral margins more or less parallel. Pereon VII with posterolateral angles greatly produced with sinuate posterior margin. Lateral nodes with long seta visible (dorsal view - Fig. 3A) except on III; glands not apparent. All pereopods with simple dactylar organ. All pereopods of male and female similar.

Pleon slightly narrower than pereon. Edges of segment 1 enclosed within sinuate posterior margin of pereon VII; edges of segments 2 to 5 closely appressed to pleon. Genital apophysis simple. Male pleopod 1 with exopod broadly oval with to



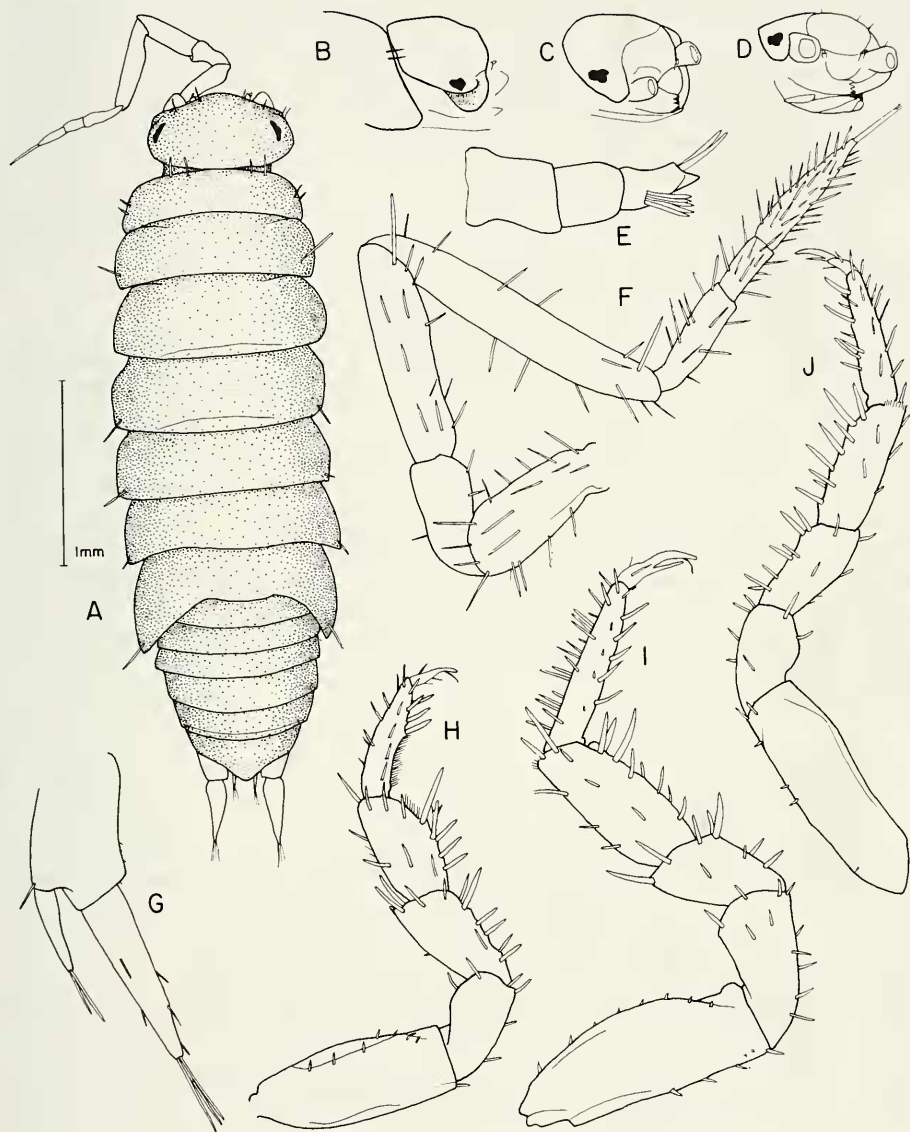


FIG. 3

*Alboscia elongata* n. gen. n. sp.: A) dorsal view; B) cephalon, lateral view; C) cephalon, oblique view; D) cephalon, ventral oblique view; E) antenna 1; F) antenna 2; G) uropod; H) male pereopod I; I) male pereopod II; J) male pereopod VI.

marginal setae; endopod elongate, moderately curved apically. Male pleopod 2 with exopod about half length of elongate, thin, pointed endopod; exopod with three setae on posterolateral margin. Male pleopods 3 to 5 and female pleopods 2 to 5 with one or few marginal setae. Pleotelson plain, posterolateral margins slightly concave; posterior margin obtusely pointed. Uropod with basis only partially projecting from under pleotelson; endopod about half length of exopod and set on basis well ahead of exopod. Both rami tipped with few long setae.

Measurements. Male to 3.6 mm long.

TYPE LOCALITY. Concepcion prov. between Est. Estrellas and Est. Primavera, sifting forest litter, 16.X.1979: 2 males; 1 female (holotype male and paratypes).

DISTRIBUTION. Known only from the type locality.

Deposition of type and other specimens: MHNG.

REMARKS. The integument of *A. elongata* is thin so it must live in moist habitats. The species superficially resembles *Colombophiloscia alticola* from the Galapagos Islands as described by VANDEL (1968:98). That small, pigmentless species with few ocelli has a simple molar on the mandible, four plain and four bifurcate teeth on the tip of the endopod of maxilla 1 and a rounded posterior margin on the pleotelson. PAULIAN DE FELICE (1944) described *Philoscia gracilior* from French Guiana. It is proportionately longer than the species described here and its antennae 2 and uropods are especially elongate. It has large eyes, but the number of ocelli is unknown. Also the mouth parts, pereopods or pleopods were not described. The species probably is in a new genus, but its inclusion in Philosciidae has not been confirmed.

## BALLONISCIDAE

Balloniscidae which had no representatives in the collection was separated from Philosciidae by VANDEL (1963:83) because of the presence of five pairs of pseudotracheae. *Plataoniscus*, based on *Alloniscus borellii* Dollfus (1897) from Argentina and Bolivia, the second genus in the family, was defined by Vandel on specimens which also had five pairs of flattened pseudotracheae similar to those in species of *Balloniscus*. VANDEL (1963:86) also placed *Alloniscus griseus* Dollfus (1897) and *Porcellio argentinus* Giambiagi de Calabrese (1939) all from Argentina in *Plataoniscus*. Members of *Plataoniscus* have a vertex dividing the frontal line and an indistinct supra-antennal line according to Vandel. *Balloniscus paraguayanus* was redescribed by Lemos de Castro (1958). LEMOS DE CASTRO (1976) reviewed much information on species of *Balloniscus* and he removed *Plataoniscus argentinus* from the genus and placed it in synonymy with *Balloniscus sellowii* which he then illustrated.

The two species of *Balloniscus* from Paraguay are:

**Balloniscus** Budde-Lund, 1908

**Balloniscus paraguayanus** (Van Name, 1936)



FIG. 4

*Alboscia elongata* n. gen. n. sp.: A) male pereopod VII; B) male pleopod 1; C) male pleopod 2; D) male pleopod 3; E) male pleopod 4; F) male pleopod 5; G) maxilla 2; H) maxilla 1; I) maxilliped; J) left mandible; K) right mandible; L) female pleopod 1; M) female pleopod 2; N) female pleopod 3; O) female pleopod 4; P) female pleopod 5; Q) female pereopod I; R) female pereopod II; S) female pereopod VI; T) female pereopod VII.

Type locality and distribution. "Paraguay" only.  
 Deposition of type. The American Museum of Natural History

**Balloniscus sellowi** (Brandt, 1833)

Type locality and distribution. Montevideo, Uruguay.  
 Other locations: Argentina, western Brazil and Paraguay ("Rio Apa, Haut Paraguay")  
 Deposition of types. Types unknown. Others: MNRJ

For detailed descriptions, bibliography and other information on the two species not represented in the present collection see VERHOEFF (1951) and ARCANGELI (1958) and LEMOS DE CASTRO (1958, 1976).

DUBIONISCIDAE n. fam.

The new family is established for *Dubioniscus* Vandel (1963) the type species of which is based on specimens collected from a tropical forest near the Rio de la Plata, Argentina.

Dubioniscidae is characterized by:

- Length of oval-oblong body from tiny to small, rarely more than 6 mm long
- Antenna 1 with few aesthetascs
- Antenna 2 with three flagellar articles
- Ocellus or ocelli present
- Anterolateral lobes on cephalon well defined
- Cephalon sometimes with central-frontal depression into dorsum between two lateral ridges
- Molar of mandibles compound
- Maxilla 1 exopod with eight mostly plain teeth; endopod without pointed apex
- Dorsum smooth covered with tiny scales
- Body lightly or moderately pigmented, some in striking pattern (some might be pigmentless)
- Pereopod I of male and female (and sometimes II of male) with grooming organ on propodus and carpus
- Pleon as broad or about as broad as pereon
- Neopleurons on pleons 3 to 5 well defined dorsally, reach to general body margin; sometimes slightly recurved
- Exopods of pleopods 1 to 5 of males and females of same general pattern
- Pseudotracheae absent

Exopod of uropod extends well beyond tip of pleotelson. Since the morphology of the mouth parts of the species included in *Calycuoniscus* and most species of *Novamundoniscus* are not well known, it would be presumptuous to add definite criteria on mouth parts to the family characters other than to show those characters as illustrated for the species of *Dubioniscus* described here. For the species of the type and sometimes the new genus, flagellar article number is obscure and often mis-



takenly recorded because the division between articles 2 and 3 lacks a clear furrow. Separation of the articles is confirmed (especially in small specimens) when the flagellum is back lighted and viewed in a compound microscope. Rarely have the lateral nodes or glands on the pereons of such small specimens ever been described so that their absence, presence or pattern cannot serve as definitive family, genus or species characters at this time.

TYPE GENUS. *Dubioniscus* Vandel, 1963

OTHER GENERA. A brief synonymy of genera included in Dubioniscidae n. fam. is as follows:

*Calycuoniscus* Collinge, 1915:509

*Dubioniscus* Vandel, 1963:78 (= *Hileioniscus* Lemos de Castro, 1967:317, LEMOS DE CASTRO 1968:407)

*Novamundoniscus* n. gen. (New World *Phalloniscus* species)

?*Phalloniscus* Budde-Lund, 1908:296 (Old World species)

The species in *Calycuoniscus*, *Dubioniscus* and *Novamundoniscus* n. gen. generally are small rarely over 6 mm long. They have in common dorsal scales, three flagellar articles, well developed neopleurons on segments 3 to 5 and lack of pseudotracheae. The excuvate frontal part of the cephalon sets the species of *Dubioniscus* apart from most other species of oniscideans including those in the new genus. Two valid species are included in *Calycuoniscus* and four in *Dubioniscus* (see below).

*Calycuoniscus*, *Dubioniscus* and *Phalloniscus* have been placed by one worker or another in Oniscidae, Platyarthridae or Bathytropidae. In each family many genera are ill defined, being based on poorly described species. This is especially so for some small to tiny oniscideans. The characters which distinguish species of Dubioniscidae from species of other related families will be discussed in more detail elsewhere. Significant are two flagellar articles in Platyarthridae and Bathytropidae. Oniscidae share three flagellar articles with Calycuoniscidae, but specimens generally are larger and they have the flattened type of pseudotracheae on the exopods of the pleopods. Also, species of Oniscidae rarely have conspicuous scales on the dorsum.

### **Calycuoniscus** Collinge, 1915

COLLINGE (1915) described *Calycuoniscus bodkini* from Georgetown, Guyana. He recorded the species again in Trinidad when he described a second species, *Calycuoniscus spinosus*, in Guacharo Cave on that island. Neither species were collected in Paraguay. Both species have eyes and pigment and Collinge specifically stated that both species had three flagellar articles in their antennae 2. *Calycuoniscus bodkini* has a peculiar set of hollows in the epistome (see COLLINGE 1915, pl. 32, fig. 4). *Calycuoniscus spinosus* differs little from *C. bodkini* and it is not recorded to have the peculiar set of hollows in the epistome. LEMOS DE CASTRO (1968:410) recorded *C. bodkini* from Para and Territorio do Amapa, Brazil. Other species have been placed in the genus, but only the two species mentioned here are now in the genus. *Caly-*

*cuoniscus goeldii* Lemos de Castro (1967) from Brazil is here placed in *Dubioniscus* (see below).

VAN NAME (1936:186) briefly stated for species of *Calycuoniscus* that the division between the ultimate and penultimate articles of the flagellum is "very likely only slightly movable, if at all, thus approaching the two-segmented condition". VANDEL (1963:78) stated that if species of *Calycuoniscus* could be shown to have only two flagellar articles the genus easily could be placed in Bathytropinae (now Bathytropidae). Since all species of *Calycuoniscus* bear three flagellar articles on antenna 2, the genus also cannot be placed in Platyarthridae or Bathytropidae which have two flagellar articles. It has been placed in Oniscidae, but species in that family are large and with flattened pseudotracheae on the endopods of the pleopods.

REMARKS. TAITI & FERRARA (1986:1362), in attempting to clarify the true identity of *Alloniscus compar* Budde-Lund, 1893 from Venezuela, examined the type specimen in the Zoologiske Museum, Copenhagen. They speculated that it might be a species of *Calycuoniscus*. VANDEL (1952a:112) gave a description of *A. compar* on specimens from Venezuela now placed in *Littorophiloscia*. The identity of *A. compar* is uncertain until the type material is reexamined.

### **Dubioniscus** Vandel, 1963

*Hileioniscus* Lemos de Castro, 1967:317.

*Dubioniscus* Vandel, 162b: 2697 (nomen nudum).

*Dubioniscus* Vandel, 1963:78; 1972a:40. Lemos de Castro, 1968:408; 1970b:1. Vandel, 1973:158; 1981:43.

The type of the genus is *Dubioniscus delamarei* Vandel (1963:78) and it is described below. The division between articles 2 and 3 sometimes is difficult to see in specimens of the type species. VANDEL and LEMOS DE CASTRO erroneously recorded the number of flagellar articles as two. VANDEL stated that, aside from flagellar article number, the peculiar shape of the cephalon set *Dubioniscus* apart from other genera of Bathytropinae. Since the description of *Dubioniscus delamarei* resembled the specimens collected in Paraguay in every morphological character except in flagellar article number, VANDEL's (1963:78) description was reevaluated.

The shape of the apical of two articles as illustrated by VANDEL is the same as that illustrated for articles 2 and 3 here. The division between articles 2 and 3 is visible when antenna 2 from specimens from Paraguay is placed on slide and viewed back lighted in a compound microscope. In addition to resemblances in body type, cephalon type, scales, anterolateral lobes, neopleuron lengths and shapes, pleotelson shape and general form of male pleopods 1 and 2, the pattern of body pigmentation matches almost exactly so there is no doubt that the specimens described here are conspecific with it. LEMOS DE CASTRO (1970b:1) essentially repeated Vandel's account of *Dubioniscus* and included new localities in Brazil. He also described *D. marmoratus* from Brazil.

DIAGNOSIS. Eyes large. Three flagellar articles. Frontal margin of cephalon broadly rounded or excuvate according to angle. Anterolateral lobes of cephalon

conspicuous. Mediofrontal ("frontomedial crush") excavation in dorsum of cephalon (easily seen in dorsal oblique view). Dorsum covered with tiny scales. Male and female pereopods I with grooming organ. Pleon as wide as pereon with neopleurons 3 to 5 well developed. Pseudotracheae absent. Posterior margin of pleotelson obtusely pointed. Uropod short with short endopod arising anterior to long exopod; both rami project slightly beyond tip of pleotelson.

TYPE SPECIES. *Dubioniscus delamarei* Vandel, 1963. Type by monotypy.  
Gender. Masculine.

OTHER SPECIES. *Dubioniscus* Vandel (1963) contains four species some of which might be synonymized when details of each are known. They are:

*Dubioniscus delamarei* (Vandel, 1963) - Argentina, Paraguay

*Dubioniscus goeldii* (Lemos de Castro, 1967) n. comb. - Brazil

*Dubioniscus marmoratus* (Lemos de Castro, 1970b) - Brazil

*Dubioniscus negreai* (Vandel, 1973b) - Cuba

In his original description of what now is *Dubioniscus goeldii*, LEMOS DE CASTRO (1967) stated that two flagellar articles were present and he placed his monotypic genus *Hileioniscus* in Bathytropidae. He later (1968) illustrated the species and placed it in *Calycuoniscus* because he discovered that there were three flagellar articles. With three flagellar articles, large anterolateral lobes and with the general shape of the cephalon, among other characters, the species really is in *Dubioniscus*, not *Calycuoniscus*. VANDEL (1972) described *Dubioniscus insularis* (= *nomen nudum*) as being from Cuba, however, in his work on oniscideans from Cuba VANDEL (1973b) mentioned only *Dubioniscus negreai* (corrected from *negrae* in VANDEL, 1981).

TAXONOMIC REMARKS. *Dubioniscus* is related to *Calycuoniscus* and *Novamundoniscus* n. gen. When specimens of *Dubioniscus* are reencountered they must be reexamined and the status of each species determined based on knowledge of more details.

### ***Dubioniscus delamarei* Vandel, 1963**

Figs 5A-N, 6A-N and 7A-D

*Dubioniscus delamarei* Vandel, 1963:78, Figs 9-11. Lemos de Castro, 1970b:2.

DIAGNOSIS. Shape of exopods of male pleopods unique. Posterior margin of pleotelson produced and obtusely rounded.

DESCRIPTION. About 16 distinct ocelli. Body about 2.5 times as long as broad. Dorsum smooth, covered with tiny scales especially apparent on margins of pereons, pleonal segments and pleotelson. Cephalon shallowly set into pereon I. Cephalon with broad medial depression into dorsum. Frontal line well developed laterally with medial interruption. Frontal margin (dorsal view) broadly rounded. Anterolateral lobes well developed. (If cephalon is tipped forward and downward enough, medial depression clearly is visible centrally on cephalon).

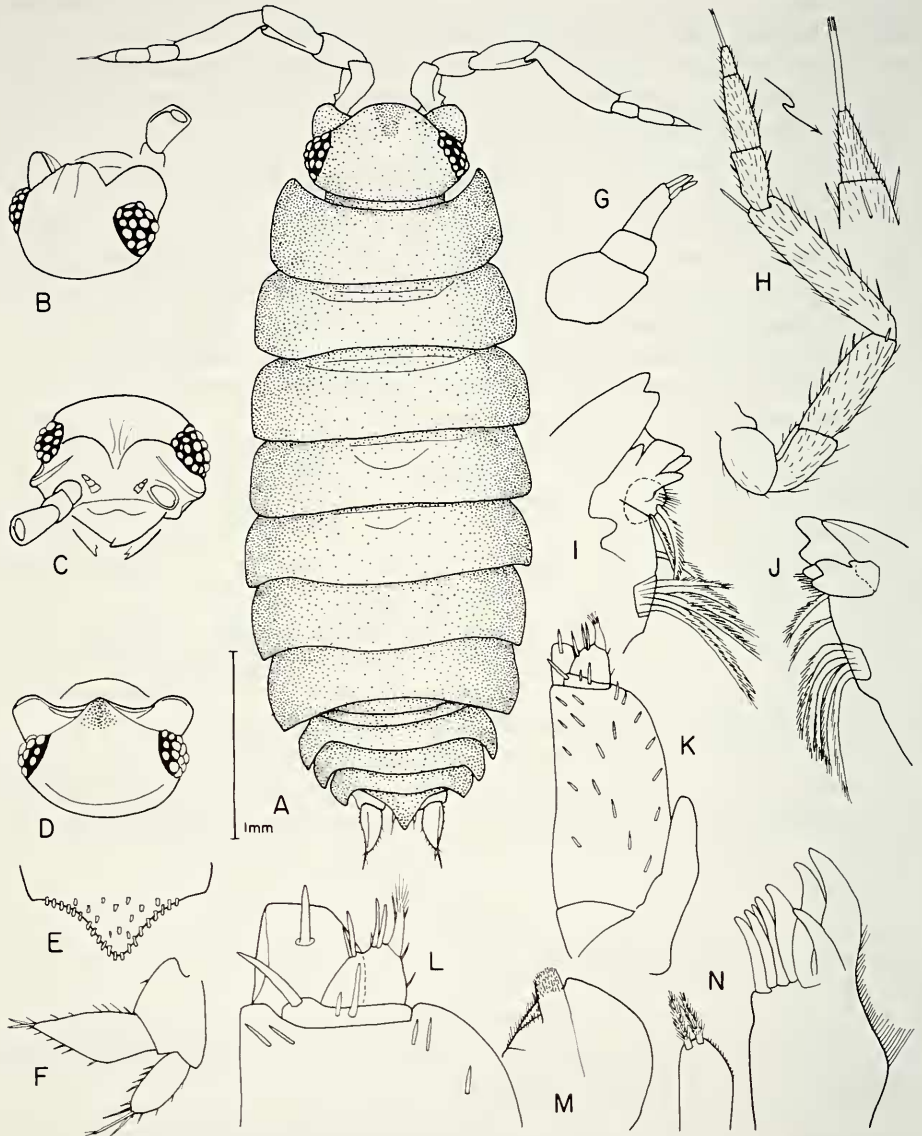


FIG. 5

*Dubioniscus delamarei* Vandel, 1963: A) dorsal view; B) cephalon, dorsal oblique; C) cephalon, frontal view; D) cephalon, dorsal view; E) pleotelson; F) uropod; G) antenna 1; H) antenna 2 (with detail of flagellar tip); I) left mandible; J) right mandible; K) maxilliped; L) detail maxilliped; M) maxilla 2; N) maxilla 1.



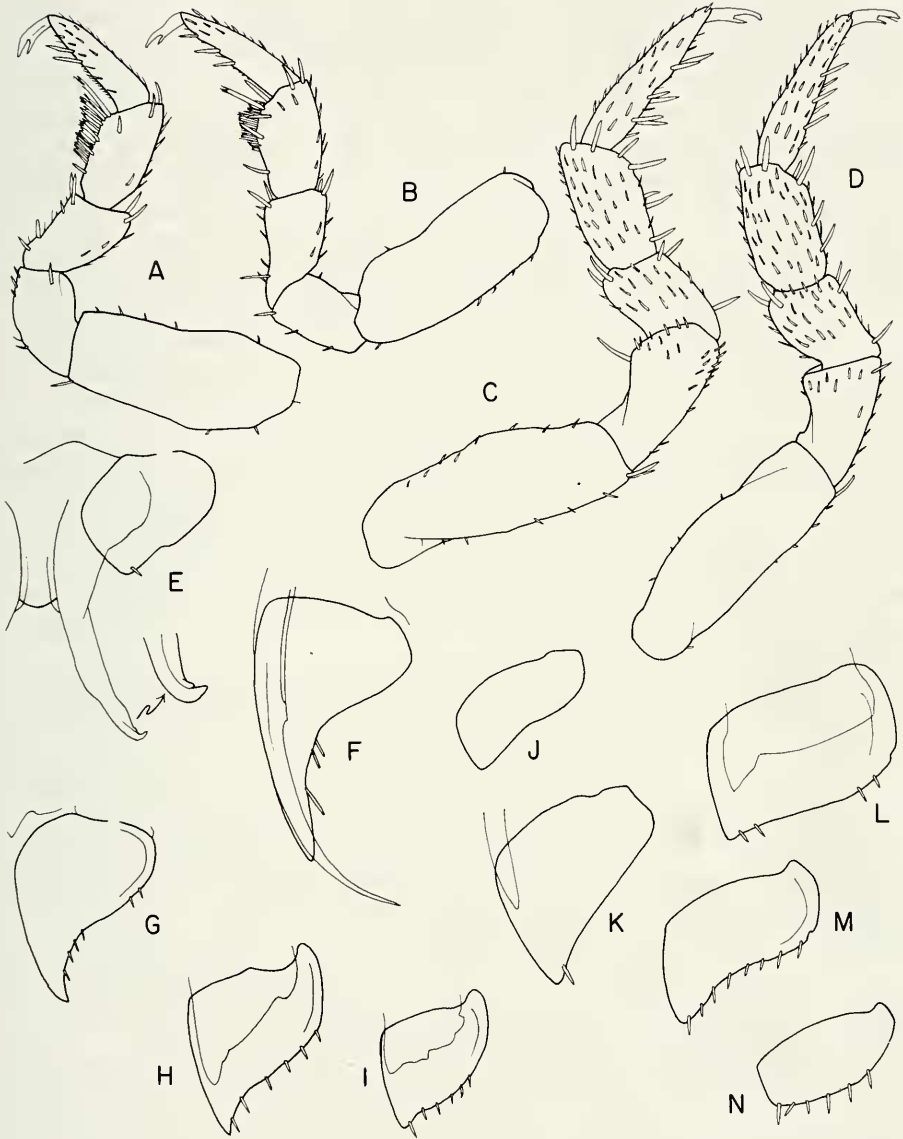


FIG. 6

*Dubioniscus delamarei* Vandel, 1963: A) male pereopod I; B) male pereopod II; C) male pereopod VI; D) male pereopod VII; E) male pleopod 1; F) male pleopod 2; G) male pleopod 3; H) male pleopod 4; I) male pleopod 5; J) female pleopod 1; K) female pleopod 2; L) female pleopod 3; M) female pleopod 4; N) female pleopod 5.

Antenna 2 moderately long, extending back to about posterior margin of pereon III; flagellar article 2 longest of three articles; apical article shortest, tipped with compound seta. Labrum rounded. Left mandible with compound molar one seta in setal row and two setae on lacinia mobilis. Right mandible with compound molar, one seta in setal row and one on lacinia mobilis. Maxilla 1 with exopod tipped with eight plain teeth; endopod with two penicillate setae near to rounded tip. Maxilla 2 with narrow sensory bulb medially placed on square apex. Maxilliped with scattered long setae on outer surface; blade with one large seta on outer surface and none on sensory edge. Palp of maxilliped with three (two large) setae on segment 1, two setal groups of two setae each on inner margin of segment 2 and apical segment tipped with tuft of setae. Epipod less than half length of maxilliped proper, rounded apically.

Lateral margins of pereon convex. Lateral nodes and glands not apparent. Pereon I partially envelops cephalon and pereon VII with long posterolateral extensions. Pereopods without conspicuous dactylar organ. Male and female pereopods I shortest, each with well defined grooming organ. Male pereopod I with two large setae in inner surface of propodus with bed of short setae as part of grooming organ. Carpus of I with very large sensory seta projecting from brush of similar setae on inner surface; some large setae distally placed laterally and on outer surfaces of carpus; merus with large setae distally placed both on inner and outer surfaces; ischium and basis with few setae. Female pereopod I with two long setae on inner surface with short setae as part of grooming organ; carpus with at least six large setae on inner surface and one distally on outer surface.

Pleon continuous with pereon; segments 1 and 2 with edges under posterolateral extensions of pereon VII; neopleurons on segments 3 to 5 long, broad, recurved and extended to general body margin. Genital apophysis broad with rounded apex. Male pleopod 1 with short exopod, with one marginal subapical seta; endopod with hook shaped apex. Male pleopod 2 with exopod elongate with three long marginal setae; endopod elongate and pointed; pleopod 3 elongate with at least six marginal setae. Exopod female pleopod 1 tiny without marginal setae; pleopod 2 larger than 1 with one subapical seta; exopod pleopod 3 largest with at least four marginal setae. Pleotelson medially produced, apex pointed; fringing and tiny surface setae apparent. Uropod extends beyond tip of pleotelson with basis small; each ramus flattened with exopod arising on an angle to endopod. Both emerge from about same level. Flattened endopod ovate about half length of flattened basis; both rami tipped with few setae.

Particular pattern of brownish red pigment on dorsum and two spots of pigment on outer basis of pereopods. Mature specimens markedly darker than immature. Two very dark outstanding spots laterally placed dorsally on pereon IV and two on posterior border of VII. Spots continue to edges of pleonal segments (see Vandell, 1963:79, Fig. 9).

Measurements. To 4.8 mm long.

TYPE LOCALITY. Punta Lara, north of La Plata, at the edge of Rio de la Plata, Argentina. VANDELL stated that the location was a fragment of a tropical forest.

DISTRIBUTION. The range of the species is extended from northern Argentina and Brazil to Paraguay where it was collected at two stations: Misiones prov., 30 km S San Juan Bautista

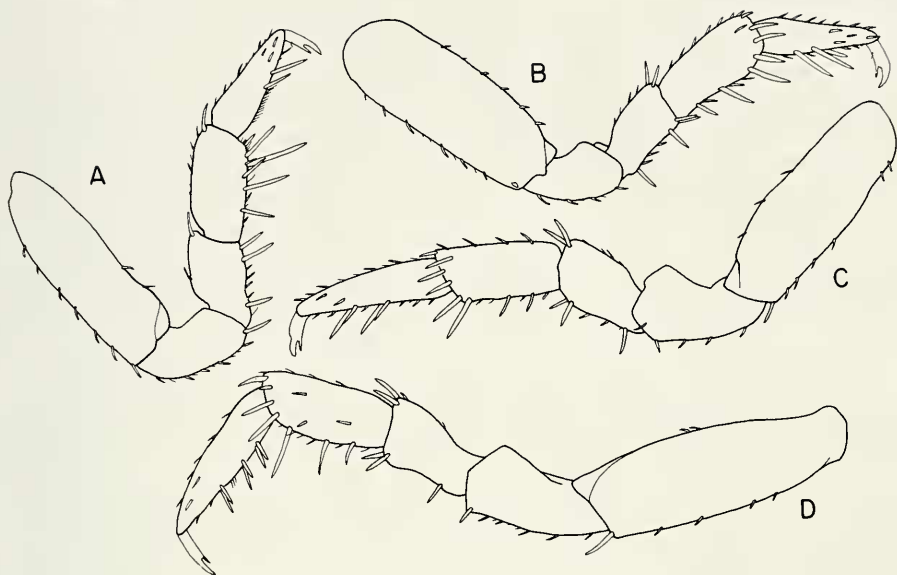


FIG. 7

*Dubioniscus delamarei* Vandel, 1963: A) female pereopod I; B) female pereopod II; C) female pereopod VI; D) female pereopod VII.

(road to San Ignacio), sifting leaf litter in forest near Ao. Aguaray, 14.X.1982: 1 male, 1 female; Neembucu prov., 5 km NW Pilar, sifting under shrubs (with Cactacea) near Rio Paraguay, 18.X.1982: 8 males, 11 females.

**ECOLOGY.** The species lives in the leaf litter of forested places. A large female 4.5 mm long had six advanced embryos tightly packed in its marsupium. The largest female was 4.8 mm long.

**Deposition of type and other specimens.** Type: Unknown. MHNG.

**TAXONOMIC REMARKS.** *Dubioniscus delamarei* is best compared to *D. goeldii* and *D. bodkini* which have a long broadly rounded pleotelson (see LEMOS DE CASTRO, 1968:409, Figs 1-16). Exopods of male pleopods 1 and 2 are differently shaped as well.

**REMARKS.** COLLINGE (1915; 1917) stated in his descriptions of two species of *Calycuoniscus* that there were three articles on antenna 2. VANDEL (1963) stated "les plus remarquables du céphalon du *Dubioniscus* réside dans l'existence de lobes frontaux latéraux bien développés, mais ne continuant pas la ligne frontale." It is this character and the three flagellar articles, among others, which defines *Dubioniscus*. Specimens from Paraguay compared perfectly to the specimen illustrated by VANDEL (1963:74, Figs 9-11) in shape of male pleopods 1 and 2 and in dorsal color pattern.

**Novamundoniscus** n. gen.

*pars Phalloniscus* Budde-Lund, 1908:296 (New World species only).

*Phalloniscus* has been a dumping place for many small oniscideans from many diverse temperate and tropical parts of the world. To date about 36 species have been included in the genus. How many of them are valid members is yet to be determined. Species from the New World included in *Phalloniscus* are placed in *Novamundoniscus* n. gen. here. However, more details on the morphology of some species must be made available to confirm their placement in the new genus. In spite of several redefinitions of *Phalloniscus* and placement of about 36 species in it, no accurate definition of the genus or its type species *Oniscus punctatus* Thompson (from Dunedin, South Island, New Zealand) is available (BUDDE-LUND, 1908; BOWLEY, 1935; VANDEL, 1952a, b, 1962a, 1973a, 1977).

A brief review of the characters on which many species in *Phalloniscus* are based shows that the genus is composed of a heterogenous assemblage of species many of which are not well defined. Few species really have been compared in particular characters or in detail to the type or related species from New Zealand. Species of *Phalloniscus* from the Old World (including New Zealand) and species from the New World are in many important characters markedly different. VANDEL (1962a:531) stated that someday isopodists might take all species of *Phalloniscus* and "... il soit amené à les ranger dans des genres distincts." Each species must be redescribed and reevaluated so that *Phalloniscus* itself can be redefined accurately. Descriptions of all former species of *Phalloniscus* from the New World were examined and the following tentative diagnosis of *Novamundoniscus* resulted.

DIAGNOSIS. Eyed (or eyeless). Three flagellar articles. Anterolateral lobes moderately well developed; frontal line interrupted medially. Dorsum lightly covered with scales. Glands and lateral nodes, if present, not at all well defined. Pigmentation of dorsum various (sometimes absent?). Molar of mandible compound. Maxilla 1 exopod tipped with regular and bifurcate teeth. Maxilla 2 with distinct sensory bulb mediolaterally placed on tip. Apical article on maxilliped tipped with distinct setae not tuft of setae; distinct setae in two groups on inner margin of second palp article; basal article with at least two long setae. Endite or blade of maxilliped simple with one seta. Pleon as wide as pereon, with neopleurons well developed on segments 3 to 5. Pereopod 1 of male with grooming organ. Pseudotracheae absent. Exopod of male pleopod 1 about 1/3 length of simple with no marginal setae; endopod acutely pointed. Exopods of pleopods 2 to 5 with few to several setae on margins. Pleotelson broad with posterior margin obtusely rounded. Uropods project well beyond tip of pleotelson. No species of *Phalloniscus* from New Zealand or Europe has this combination of characters.

TYPE SPECIES. *Phalloniscus vandeli* Lemos de Castro, 1959. Type by original designation.

Gender. Masculine.

OTHER SPECIES. The 12 named species formerly in *Phalloniscus* from the New World are tentatively transferred to *Novamundoniscus* n. gen.:



- Phalloniscus avrilensis* (Van Name, 1940)  
*Phalloniscus baldoni* (Arcangeli, 1930)  
*Phalloniscus barbouri* (Van Name, 1926)  
*Phalloniscus dissimilis* Lemos de Castro, 1959\*  
*Phalloniscus laugi* Van Name, 1936  
*Phalloniscus macrophthalmus* Lemos de Castro, 1959\*  
*Phalloniscus marcuzzii* Vandel, 1952a\*  
*Phalloniscus pearsei* Van Name, 1936  
*Phalloniscus persimilis* Vandel, 1952a\*  
*Phalloniscus setosus* Lemos de Castro, 1959  
*Phalloniscus singularis* Lemos de Castro, 1967\*  
*Phalloniscus* sp. Lenko, 1966  
*Phalloniscus vandeli* Lemos de Castro, 1959\*

Only *Phalloniscus macrophthalmus* and species marked with an "\*" should be thought to be included with some assurance in *Novamundoniscus* n. gen. based on knowledge of relevant characters. Complementary information was added to the description of *P. singularis* by LEMOS DE CASTRO (1970a).

REMARKS. Enough differences are present to separate species from the New World from those recorded from New Zealand and Europe. *Novamundoniscus* n. gen. is the first set of species to be removed from the former about 36 species of *Phalloniscus*.

***Novamundoniscus vandeli* (Lemos de Castro, 1959) n. comb. Figs 8A-M and 9A-Q**

*Phalloniscus vandeli* Lemos de Castro, 1959:205, Pl. I, Figs 1-9.

DIAGNOSIS. Shape of male pleopods 1 and 2 diagnostic.

DESCRIPTION. Darkly pigmented eyes of 8 to 11 ocelli. Body about 2.4 times as long as broad. Dorsum lightly covered with tiny scales; very light redish brown to dark brown pigment (largest specimens darkest). Cephalon set moderately deep into pereon I. Cephalon with obtusely rounded frontal margin; anterolateral lobes small and inconspicuous. Frontal line present only laterally with a small medial bulge arising from front of cephalon. Supra-antennal line defined only over antennae 2. Lateral nodes present. Glands, if present, not well defined. Antenna 1 with six aesthetascs three each in two tiers. Antenna 2 extends back to about posterior edge of pereon III; flagellum shorter than peduncular segment 5 with three subequal articles apical one tipped with compound seta. Joint between flagellar articles 2 and 3 (unless backlighted) appears to be fused (the two articles can appear to be one article).

Labrum broadly rounded with some sensory setae medially on edge. Right mandible with compound molar; two setae in setal row; one on lacinia mobilis. Left mandible with compound molar; one seta in setal row; one on lacinia mobilis. Hypopharynx bilobed with scale-like seta on apex of each lobe. Maxilla 1 with three large and one small plain teeth on outer apical margin; four, one bifurcate, smaller teeth on inner apex; endopod with two apical penicillate setae. Maxilla 2 with broad

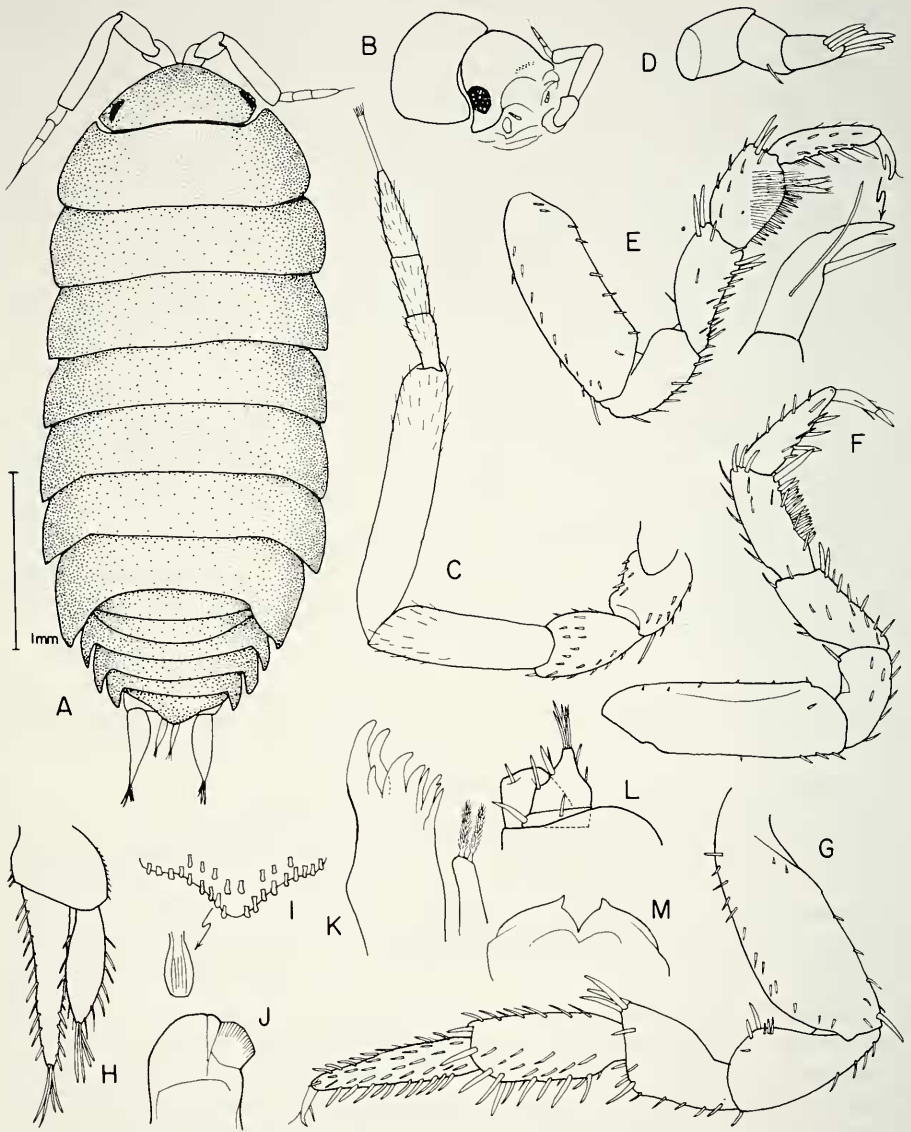


FIG. 8

*Novamundoniscus* n. gen. *vandeli* (Lemos de Castro, 1959): A) dorsal view; B) cephalon, oblique view; C) antenna 2; D) antenna 1; E) male pereopod I; F) male pereopod II; G) male pereopod VII; H) uropod; I) pleotelson, with detail of scales; J) maxilla 2; K) maxilla 1; L) maxilliped; M) hypopharynx.

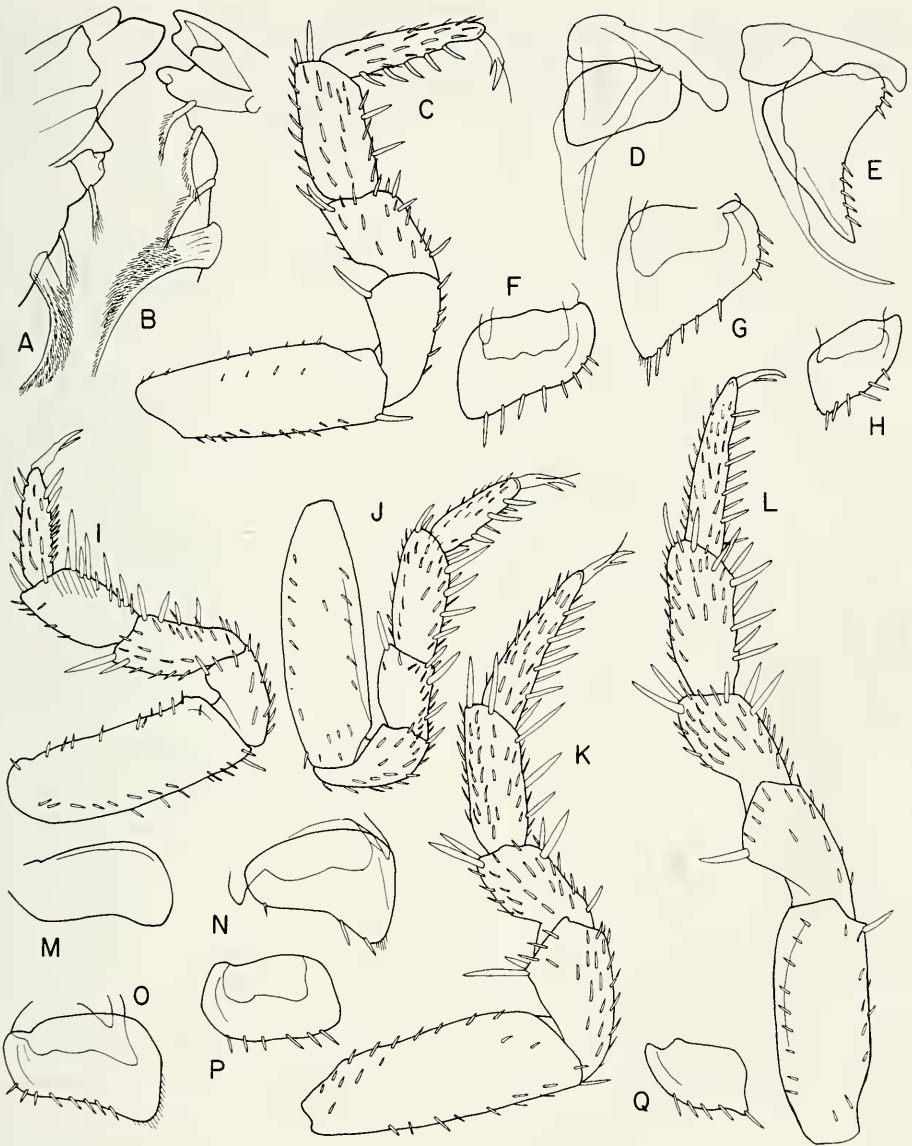


FIG. 9

*Novamundoniscus* n. gen. *vandeli* (Lemos de Castro, 1959): A) right mandible; B) left mandible; C) male pereopod VI; D) male pleopod 1; E) male pleopod 2; F) male pleopod 4; G) male pleopod 3; H) male pleopod 5; I) female pereopod I; J) female pereopod II; K) female pereopod VI; L) female pereopod VII; M) female pleopod 1; N) female pleopod 2; O) female pleopod 3; P) female pleopod 4; Q) female pleopod 5.

sensory bulb on inner third of rounded apex. Maxilliped with outer surface with many scale-like setae; blade tipped with one seta on inner margin near plain sensory edge. Palp with two long setae on basal segment; second segment with two large setae, each with smaller seta arising from upper part of inner rounded margin; apical segment tipped with broad set of long setae. Epipod of maxilliped more than half length of maxilliped proper, apex acutely pointed.

Pereon with lateral margins more or less parallel. All pereopods with simple string-like dactylar organ. Male pereopod I with four setae on inner surface of propodus; carpus with two large sensory setae on inner surface projecting from brush of many shorter sensory setae, long setae apically placed on outer surface. Female pereopod I with two long setae and other setae, but no brush of setae on inner surface of carpus; carpus with one very long seta and other setae on inner surface.

Pleon continuous with pereon; segments 1 and 2 enclosed within curved posterolateral extensions of pereon VII. Elongate neopleurons on segments 3 to 5 slightly recurved, extended to general body outline. Genital apophysis simple. Male pleopod 1 with exopod short and simple; endopod elongate with pointed tip. Male pleopod 2 elongate with at least eight marginal setae; endopod long and thin; pleopods 3 to 5 short with progressively fewer marginal setae on each. Female pleopod 1 exopod simple; pleopod 2 with produced medial margin with three marginal setae. Female pleopods 3 larger 4 and 5 with progressively less setae on margins. Pleotelson medially produced with rounded apex; marginal and dorsal scales conspicuous. Uropod with short basis projects only slightly from under pleotelson; endopod about 2/3 length of exopod; both rami tipped with few setae.

Measurements. Adult specimens range between 3.5 and 4 mm long.

TYPE LOCALITY. Barra do Sana, Macae, Estado do Rio de Janeiro, Brazil.

DISTRIBUTION. LEMOS DE CASTRO recorded the species from Estado do Minas Gerais and Estado do Rio de Janeiro, Brazil. The species was the most numerous and widespread of all oniscideans collected in Paraguay having been taken at 27 stations which are as follows: Alto Parana prov., near Puerto Santa Teresa, sifting leaf litter in tropical forest, 3.XI.1979: 21 ex.; Ciudad del Este (= Pto Pte Stroessner), Forestry school, sifting litter in primary forest, 6.XI.1979: 2 ex.; same loc., in pin tree forest, 15.11.1983 (lg. P. Berner): 2 ex.; near Arroyo Itabo Guazu, sifting litter in tropical forest, 4.XI.1979: 14 ex.; Amambay prov., 80 km S Bella Vista, near Ao. Negla, sifting bamboo litter, 1.XI.1979: 4 ex.; Parc Nacional Cerro Cora, sifting leaf litter, 24.X.1979: 7 ex.; Caaguazu rov., 20 km N Colonel Oviedo, sifting leaf litter in forest, 7.X.1979: 6 ex.; Canendiyu prov., Rio Carapa near junction with Rio Alto Parana, sifting litter in tropical forest: Central prov., San Lorenzo, Villa del Maestro, sifting leaf litter, 5.X.1979: 25 ex.; Colonia Thompson, 20 km S Asuncion, sifting leaf litter and rotten wood, 10.XI.1979: 14 ex.; Concepcion prov., Colonia Sgto Jose E. Lopez, sifting in forest islands, 13.X.1979: 14 ex.; Estancia Estrellas, banks of Rio Apa (50 km E San Lazaro), sifting in gallery forest, 15.X.1979: 2 ex.; between Est. Estrellas and Est. Primavera, sifting in dry forest, 16.X.1979: 27 ex.; Est. Viancho Postillon (5 km E Puerto Max), sifting in gallery forest, 19.X.1979: 54 ex.; between Isla Real and Est. Sta Maria, sifting in gallery forest of Ao. Tagatya - mi, 20.X.1979: 62 ex.; near Estancia Garay-Cue, sifting bamboo litter, 22.X.1979: 8 ex.; same loc., sifting in dry forest, 22.X.1979: 1 ex.; Itapua prov., 10 km S Santa Maria, sifting in primary forest, 25.X.1982: 19 ex.; San Benito (Pastorea), sifting in gallery forest with bamboos, 29.X.1982: 8 ex.; 4 km above Salto Tembey, sifting litter in tropical forest, 1.XI.1982: 9 ex.; Misiones prov., 30 km S San Juan Bautista (road to San Ignacio), near crossing over Ao. Aguary, sifting forest litter, 14.X.1979: many (specimens redescribed); Panchito Lopes (4 km N Yabebry), sifting of forest litter, 22.X.1982: 23 ex.; Neembucu prov., 5 km NW Pilar,



sifting under shrubs (with Cactacea) near Rio Paraguay, 18.X.1982: many; same loc., sifting in Eucalyptus plantation, 18.X.1982: 20 ex.; Paraguari prov., 3 km N Carapegua, sifting under shrubs, 7.X.1982: many.

**ECOLOGY.** The species is widespread in Paraguay where it lives in moderately moist leaf litter and organic detritus.

Deposition of type and other specimens. Types: MNRJ. Others: USNM 267280. BM(NH) 1994.4797-4806. MHNG.

**TAXONOMIC REMARKS.** The specimens described here also closely correspond in morphology to *Novamundoniscus macrophthalmus* also collected from near Rio de Janeiro by LEMOS DE CASTRO (1959:205). The specimens described here correspond most closely to the description and illustrations of *N. vandeli* in cephalon type and overall eye size (not in ocelli number). They correspond in many other details to the illustrations of *N. macrophthalmus*, although most characters are intermediate. The number of ocelli in *N. vandeli* is about eight and in *N. macrophthalmus* it is about 13. The eye as a whole on the specimens described here (8 to 11 ocelli) does not appear to be as large as those illustrated for *N. macrophthalmus*. Specimens of *N. vandeli* less than 2 mm long have only five ocelli suggesting that ocelli number increases with molt. After determining the number of ocelli in mature specimens from several locations, the number tends to be closer to eight and this makes the specimens collected here closer to *N. vandeli* rather than to *N. macrophthalma* with 13 ocelli.

The shape of the exopod of male pleopod 1 is intermediate in shape between the simple shapes of both species. The species *N. vandeli* has less than the four bifurcate teeth on the tip of the exopod of maxilla 1. Only one was seen clearly on maxilla 1 of the specimen illustrated here. *N. setosus* also is very similar to the former species. *N. dissimilis* has a differently shaped exopod of male pleopod 1 and the tip of the endopod has a unique shape. Examination of a series of specimens from southern Brazil and Paraguay might show a gradation of characters which would show that *N. vandeli*, *N. macrophthalmus* and *N. setosus* are conspecific. *N. dissimilis* most likely will remain as a distinct species.

**REMARKS.** Short, young specimens of *N. vandeli* differ enough from adult specimens to be mistaken as a different species. The ocelli number for specimens of 2 mm or less is five. The short specimens have a lighter body pigment and a superficial "frosted" appearance when compared to adults. A gradual darkening of color is correlated with length. The frosted appearance is, in part at least, the result of the presence of many tiny scales on the dorsum which probably are proportionately larger on young specimens than on adults.

## PLATYARTHRIIDAE

Species of Platyarthridae are with or without ocelli. They are small, covered with tiny scales, with two flagellar articles and they lack pseudotracheae. The pereon-pleon width and shape of the neopleurons vary according to species. The posterior margin of the pleotelson either is obtusely pointed or broadly rounded. Uropods are

elongate but of many shapes. Pigmentless, lightly pigmented and darkly pigmented species are known. Ocelli number and body pigmentation are correlated and those with no pigment rarely have an ocellus or they have only one or a few ocelli. Platyarthrids, especially species in *Trichorhina*, frequently are collected in leaf litter and thick organic decay. Species are from tropical and warm temperate regions in the world and several are expansive, having been spread throughout much of the warmer parts of the world by humans. *Trichorhina heterophthalma* recorded here is such a species.

Some species of Platyarthridae are parthenogenetic. Many species of Platyarthridae are associated with ants. The two species of Platyarthridae recorded here from Paraguay, one without ocelli (*Trichorhina brasiliensis*) and one with two ocelli (*T. heterophthalma*), are not directly associated with any particular ant or other insect hosts. Males and females are known for both species. VANDEL (1962a:433) included a comprehensive definition of Platyarthridae (= Squamiferidae) and he included an extended definition of *Platyarthrus* (p. 441) and *Trichorhina* (p. 434). Characters on which many species in several genera of Platyarthridae can be distinguished with confidence are yet to be established.

### **Trichorhina** Budde-Lund, 1908

DIAGNOSIS. Eyed or without eyes. Two flagellar articles. Frontal line and supra-antennal lines not easily distinguished. Body oblong-oval, pigmentless or lightly pigmented; dorsum covered with tiny scales. Pereon-pleon width variable. Shape and length of neopleurons variable. Pseudotracheae absent. Uropods reach beyond tip of pleotelson. Posterior margin of pleotelson pointed or obtusely rounded.

TYPE SPECIES. *Alloniscus tomentosus* Budde-Lund, 1893 (= *Trichorhina tomentosa*).

Gender. Feminine.

OTHER SPECIES. About 65 species worldwide have been included in *Trichorhina*. Most are poorly described so many must be redescribed to be confirmed as a member of the genus or to determine actual taxonomic placement.

REMARKS. VANDEL (1952b:526) described *Phalloniscus bolivianus* from one female specimen 4.5 mm long taken in Bolivia. Antennae 2 were missing from the specimen. He placed the species in *Phalloniscus* because the pattern of glands and pores on the pereons were more like those in Oniscidae rather than those in his Squamiferidae (= Platyarthridae). Six ocelli were recorded. Pseudotracheae were absent. Later VANDEL (1956:300) described the male and showed that it had two, not three, flagellar articles. He then placed *Phalloniscus bolivianus* in *Trichorhina* because of the two flagellar articles and lack of pseudotracheae among other characters.

*Trichorhina heterophthalma*, a cosmopolitan species (see above) distinguished by the presence of two ocelli, is recorded here for the first time from Paraguay (see SOUZA-KURY, 1993). One gravid female specimen 2.5 mm long was taken at Concepcion near Estancia Garay-Cue, sifting bamboo litter, 22.X.1979. Lack of ocelli

makes *T. brasiliensis* (redescribed below) different from *T. heterophthalma* (2 ocelli) and from *T. boliviana* (6 ocelli) collected in nearby Bolivia. Two new species recorded from Brazil by SOUZA-KURY (1993) have eyes.

**Trichorhina brasiliensis** Andersson, 1960

Figs 10A-O and 11A-R

*Trichorhina brasiliensis* Andersson, 1960:552, fig. 8.

The pigmentless species without eyes was described by ANDERSSON (1960) from Nova Teutonia, Ita, Estado do Santa Catarina, Brazil. His description was based on a tiny male 1.82 mm long and one tiny female. Here both male and female are described in detail, based on mature specimens. Only minor differences are present when compared to Andersson's less comprehensive description.

DIAGNOSIS. Eyeless. Oblong-oval body pigmentless. Anterolateral lobes small. Pleon about as wide as pereon. Male pleopod 1 with exopod short and simple; endopod elongate, only moderately curved apically. Male pleopod 2 exopod produced with two large subapical setae; endopod long, thin and pointed.

DESCRIPTION. Eyeless. Oblong-oval body about two times as long as broad, pigmentless (cream colored). Dorsum with tiny scales covering relatively thin, shiny integument. Cephalon slightly more than half width of pereon I into which it is set. Anterolateral lobes small. Frontal margin of cephalon rounded (dorsal view). Antenna 1 with at least six aesthetascs bunched apically. Antenna 2 short not extending beyond posterior border of pereon III. Flagellum with two articles about as long as peduncular article 5 with article 1 about half length of article 2. Flagellar articles covered with long setae and article 2 tipped with long compound seta; peduncular articles covered with small scales and few setae.

Labrum broadly rounded with some medial small fringing setae. Left mandible with compound molar, one seta in setal row and two setae on lacinia mobilis. Right mandible with compound molar, one seta in setal row and lacinia mobilis without setae. Hypopharynx with two large lobes with seta at apex; one tiny medial lobe. Exopod of maxilla 1 with three large outer plain teeth, three inner teeth, medial one bifurcate; endopod with two subapical penicillate setae. Maxilla 2 with apical, medial 1/3 expanded slightly into medial sensory bulb. Maxilliped with outer surface with few long setae, blade with long seta; basal segment of palp with three setae, medial one shortest; second segment with two setae on curved inner border, first one single, second with several setae; apical segment pointed with long setae. Epipod of maxilliped more than half as long as maxilliped proper, apex rounded.

Pereon with convex lateral borders. All pereopods covered with scale-like setae; tip of dactylus with two claws, upper one curved, lower one thin and sharp. Male pereopod I with two setae on inner surface; grooming modifications confined to propodus; carpus with many setae on inner surface. Shape and setation of female pereopod I resembles that of male; grooming organ absent.

Pleon continuous with pereon with segments 1 and 2 enclosed within convexity of posterior border of pereon VII. Neopleurons on segments 3 to 5 recurved and

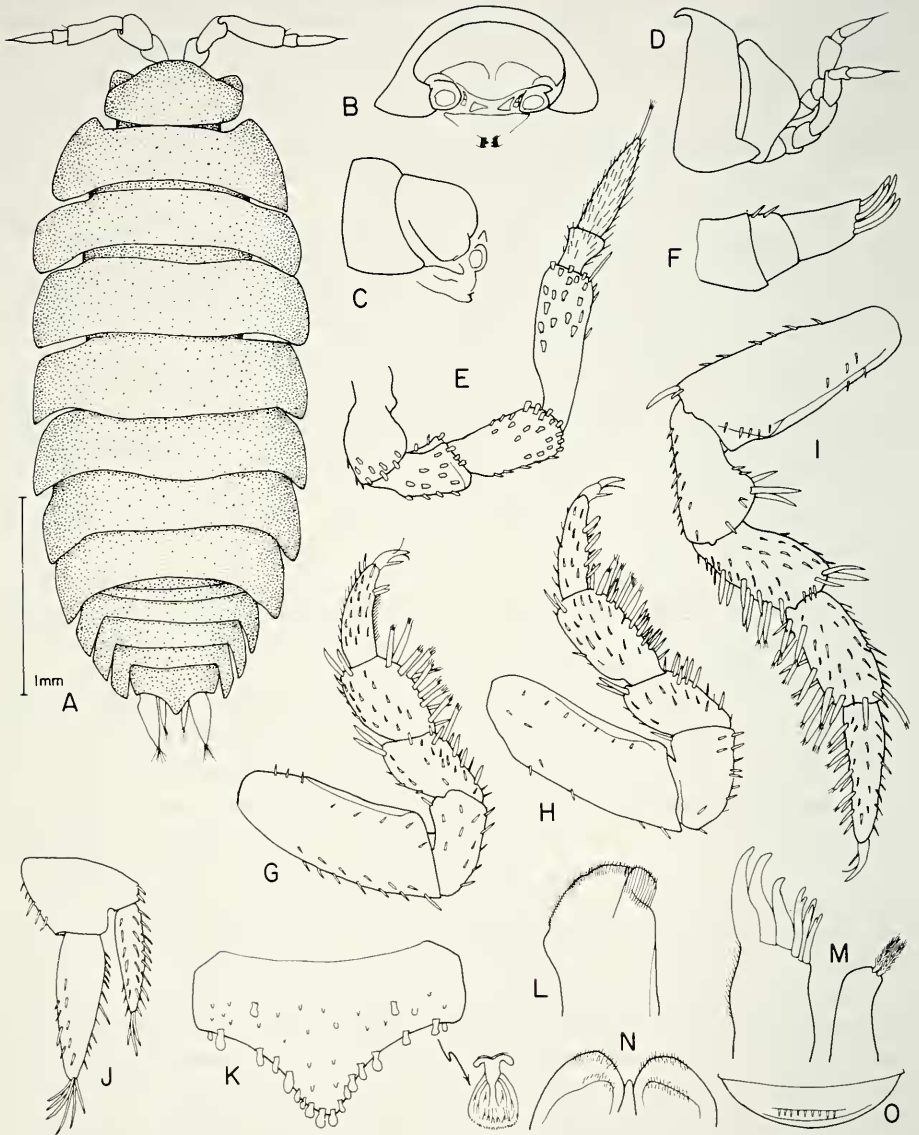


FIG. 10

*Trichorhina brasiliensis* Andersson, 1960: A) dorsal view; B) cephalon, frontal view; C) cephalon, lateral view; D) cephalon, posterior oblique view; E) antenna 2; F) antenna 1; G) male pereopod I; H) male pereopod II; I) male pereopod VI; J) uropod; K) pleotelson, with detail of scales; L) maxilla 2; M) maxilla 1; N) hypopharynx; O) labrum.



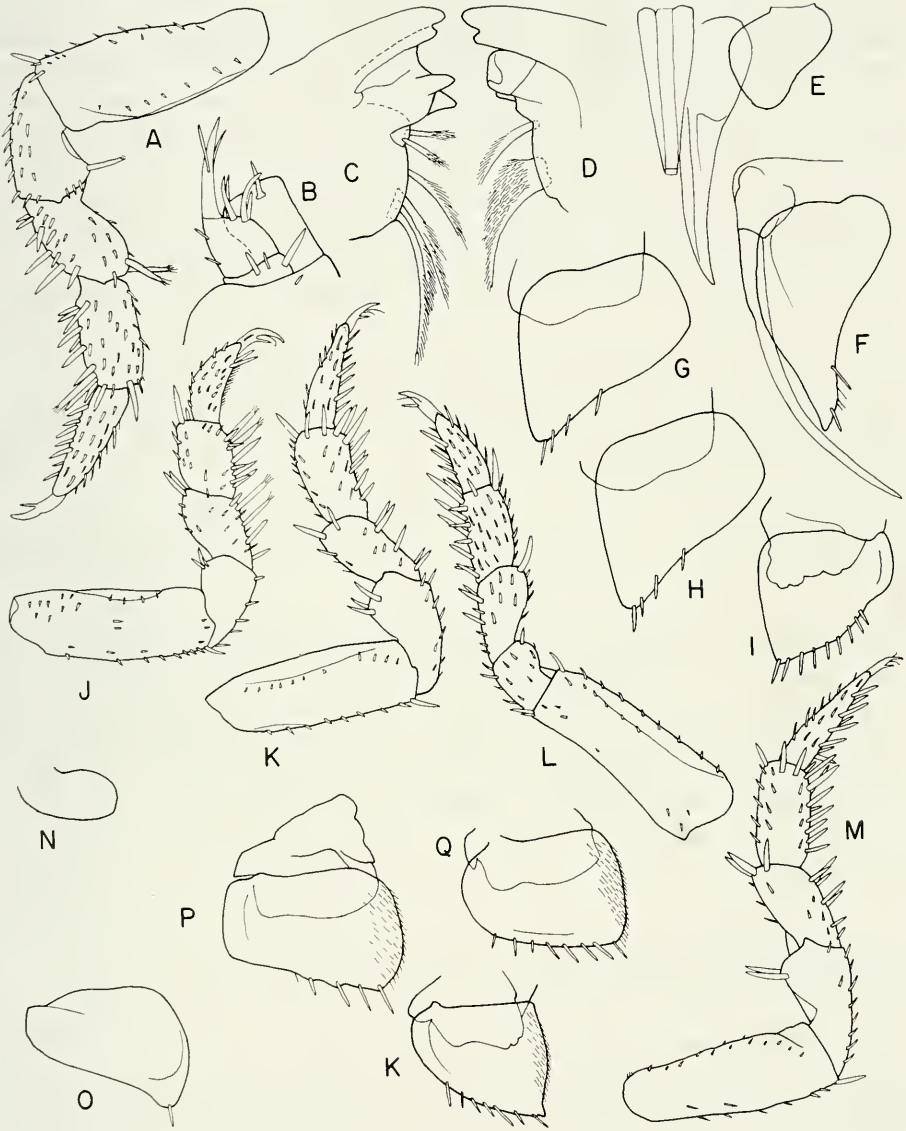


FIG. 11

*Trichorhina brasiliensis* Andersson, 1960: A) male pereopod VII; B) maxilliped; C) left mandible; D) right mandible; E) male pleopod 1; F) male pleopod 2; G) male pleopod 3; H) male pleopod 4; I) male pleopod 5; J) female pereopod I; K) female pereopod II; L) female pereopod VI; M) female pereopod VII; N) female pleopod 1; O) female pleopod 2; P) female pleopod 3; Q) female pleopod 4; R) female pleopod 5.

extended to general body margin. Genital apophysis simple. Male pleopod 1 with exopod short and simple; endopod elongate, only moderately curved apically. Exopod of male pleopod 2 produced with two large subapically setae; endopod long, thin and pointed. Male pleopods 3 to 5 simple with four fringing setae on 3 and 4 and nine on 5. Female pleopod 1 tiny and rounded; pleopod 2 simple with one apical seta. Female pleopods 3 to 5 simple with four setae on 3, eight on 4 and seven on 5. Pleotelson with posterolateral margins strongly concave, posterior margin medially produced to point. Uropod extends well beyond tip of pleotelson with basis hidden and rami partially hidden (dorsal view); endopod tiny; exopod somewhat stout, length slightly longer than medial length of pleotelson; each rami tipped with setae.

Measurements. Holotype male 3.3 mm long; other specimens range between 3.5 and 4 mm long.

TYPE LOCALITY. Nova Teutonia, Ita, Estado do Santa Catarina, Brazil.

DISTRIBUTION. The species was collected at five stations: Canendiyu prov., N Curuguaty, sifting litter in gallery forest, banks of Rio Jejui-Guazu, 29.X.1979: 1 male, 1 female, the specimens illustrated here are from this station; Concepcion prov., near Estancia San Luis, sifting leaf litter, 15.X.1979: 1 ex.

ECOLOGY. The type specimens were collected from under rocks.

Deposition of type and other specimens. Holotype male and female - Swedish State Museum, Stockholm. MHNG.

TAXONOMIC REMARKS. The species resembles *Trichorhina boliviana* in the general shape of the exopods of male pleopods 1 and 2 and in the configuration and setal pattern of the maxilliped. However, that species clearly has six ocelli. *Trichorhina heterophthalma* (recorded above) has two ocelli and *T. tomentosa*, also a very widespread species, has one ocellus. ANDERSSON (1960:555) compared the species to other species of *Trichorhina* without ocelli. Species of *Trichorhina* without ocelli have been recorded from caves in Mexico, but they are poorly characterized.

## SCLEROPACTIDAE

Scleropactidae is based on *Scleropactes*, a genus which has two flagellar articles on antenna 2. Other genera in the family have three flagellar articles. Scleropactids are small to moderately long, with a highly arched body and smooth dorsum. They roll into a tight ball. SCHMALFUSS (1980) reviewed the genera of Scleropactidae (= Sphaeroniscidae) including *Circoniscus*. The family is defined in part on the characteristic shapes of the pleotelson and uropods. Later SCHMALFUSS (1986, Fig. 1) revised his cladogram and included *Circoniscus* and *Sphaeroniscus* as a sister group with notches on the underedge of pereon I as a common character and flagellar article number, two for species of *Circoniscus* and three for species of *Sphaeroniscus*, as a differentiating character.

**Circoniscus** Pearse, 1917

*Circoniscus* was based by PEARSE (1917) on *C. gaigei* from British Guiana (now Guyana). The genus was reviewed by SOUZA & LEMOS DE CASTRO (1991) who revived four previous synonyms of the type, *C. gaigei* and described three new species. SOUZA & LEMOS DE CASTRO did not mention *Parcirconiscus ornatus* Verhoeff which was reduced to a synonym of *C. gaigei* by SCHMALFUSS (1986, p. 8). SOUZA & LEMOS DE CASTRO present no reasons why they removed the former species from synonymy with *C. gaigei* and they defined their new species on very unconvincing characters. There probably are only two species in *Circoniscus*, the type *C. gaigei* (with synonyms *C. hamatus* Van Name, *C. intermedius* Souza & Lemos de Castro, *Paracubaris spinosus* Collinge and *Parcirconiscus ornatus* Verhoeff) and *C. bezzii* Arcangeli (with synonyms *C. gracilidens* Souza & Lemos de Castro, *C. incisus* Souza & Lemos de Castro and *C. pallidus* Arcangeli). The two species are separated on differences in the configuration of the underedges of pereons I and II and their ranges of distribution are represented on the map (p. 62) of SOUZA & LEMOS DE CASTRO. The species *C. gaigei* (northern South America and Amazon valley) has only the underedge of pereon I notched and the species *C. bezzii* Arcangeli (northern Rio de la Plata drainage including Paraguay to coast near Rio de Janeiro) has pereon I and II (sometimes III) with a notch. A full synonymy of the genus and its two species now is in preparation.

DIAGNOSIS. Dorsum smooth. Two flagellar articles. Body highly arched, rolls into almost perfect ball with antennae 2 within ball. Epistome well developed projecting shelf-like above frontal line across anterior of cephalon. Underedges of pereon I (and for some species II and III) variously notched. Notch on I always indicated in lateral view. Thin pseudotracheae on exopods of pleopods 1 to 3. Basis of uropods flattened; exopods emerge medially and obliquely from inner edges of bases just beyond tip of broadly rounded pleotelson; endopods project between exopods; tips of both pairs of rami not extending beyond posterior body margin formed by posterior flattened edges of bases.

TYPE SPECIES. *Circoniscus gaigei* Pearse, 1917. Type by monotypy.

DISTRIBUTION. Species of *Circoniscus* are widespread in South America and have been recorded in several locations in Guyana, French Guiana, Brazil, Peru and now Paraguay.

**Circoniscus bezzii** Arcangeli, 1931

Fig. 12J-M

*Circoniscus bezzii* Arcangeli, 1931:115, Pl. 2. VAN NAME, 1936:311, Fig. 184. SOUZA & LEMOS DE CASTRO, 1991:50, Figs 23-44.

DESCRIPTION. Paraguay specimens: About 11 ocelli. Notch on underedge of pereons I, II and III. Color brown. For details see SOUZA & LEMOS DE CASTRO (1991, p. 50, Fig. 23-44).

Measurements. 9.6 and 7 mm long.

TYPE LOCALITY. Carandasinho, Brazil (near the border with Bolivia).

DISTRIBUTION. Paraguay. Two nongravid females were collected in Canendiyu prov., 20 km S Salto de Guaira, 1.XI.1979; 2 ex. (sifting litter in primary tropical forest). Brazil. SOUZA & LEMOS DE CASTRO (1991, Fig. 108) recorded the species from sites in the upper Rio de la Plata drainage out to the coast in the Rio de Janeiro region.

ECOLOGY. Leaf litter.

Deposition of type and other specimens. Type: Torino (Arcangeli). Others: MNRJ, MHNG.

TAXONOMIC REMARKS. The female specimens described here were taken within the range of *C. bezzii* and they differ from describes specimens of *Circoniscus gagei* because they have notches on the underedges of pereons I and II, not just I.

## ARMADILLIDAE

Armadillidae are oniscideans which have: Eyes. Thick integument. Dorsum pigmented, smooth or with low tubercles, some with spines. Highly arched body rolls into ball (except Australiodillinae Vandel, 1973) with antennae 2 kept within ball. Two flagellar articles. Five (sometimes four) pairs of pseudotracheae. Underedge of pereon I and sometimes II and III notched for rolling into tight ball for many species. Sometimes with small notch on underside of pereon I (e.g., Cubarinae). Endopod of maxilla 1 always with two penicillate setae. Flattened basis of uropods and hourglass-shaped pleotelson incorporated into expanded neopieurons of pleonal segment 5. Small to tiny exopod of uropod external on flattened basis, endopod long, medially located beneath pleotelson, rarely projecting from below pleotelson (dorsal view). Species of Armadillidae need to be better described and the notches on the underedges of pereons II and III (if present) should be used in addition to the groove on pereon I (if present) to separate genera. The absence or presence and size of the exopod of female pleopod 1 should be recorded since knowledge of its morphology is helpful in diagnosing some genera.

Most species of Armadillidae live in habitats in tropical locations which are wet much of the year, but which dry in the dry season or during some part of the year. Some live in semidesert locations. Armadillids probably live in the driest of all habitats where oniscideans have been recorded. For a good definition and discussion of Armadillidae, see VANDEL (1962a:853).

Two genera of Armadillidae, *Cubaris* and *Venezillo*, are present in Paraguay. *Cubaris* is represented by the type *C. murina* Brandt (1833) which is common in many dry, tropical locations having been widely spread by humans. VAN NAME'S (1936) inclusion of *Armadillo borellii* Dollfus (1894) from Rio Apa, Haut Paraguay as a synonym of *C. murina* apparently was accepted by ARCANGELI (1956) who revised *Venezillo*. By comparing the undersides and underedges of pereons I and II species of *Cubaris* and *Venezillo* easily can be told apart. Species of *Cubaris* have a tiny notch on the underside of pereon I and the underedge of the pereon is unmodified (VAN NAME, 1926:389, Fig. 236). The underedges of pereons II and III also are



unmodified. Species of *Venezillo* have a groove of various lengths on the underedge of pereon I (sometimes not well defined) and the underedge of pereon II (and sometimes III) is modified variously with a notch. The notch serves as a “stop” which receives the posterior pereon when specimens roll into a ball.

### **Venezillo** Verhoeff, 1928

VAN NAME (1936), in his summary of oniscideans from the New World, included most species of Armadillidae in *Cubaris*. *Veuezillo*, originally a subgenus of *Armadillo*, was raised to genus by ARCANGELI (1956) who reclassified all species of the genus and some species of related genera then known. *Venezillo bolivianus* and a new species are recorded here from Paraguay.

DIAGNOSIS. Rolls into tight ball. Underedge of pereon I modified with groove of various lengths always opening, sometime expanding, at posterior edge (sometimes underedge broad and groove apparently absent). Pereons II and sometimes III with underedge notched. Five pairs of pseudotracheae. Pleotelson hourglass-shaped. Exopod of uropod tiny.

TYPE SPECIES. *Armadillo clausus* Budde-Lund, 1885. Type by monotypy.

OTHER SPECIES. At least 68 species of *Venezillo* have been described from the New World. Most are poorly characterized.

REMARKS. VAN NAME (1936:335) arranged species of what now are *Cubaris* and *Venezillo* in subgroups according to the morphology of the underedge of pereon I and the absence or size of tubercles on the dorsum.

### **Venezillo bolivianus** (Dollfus, 1897)

Fig. 12F-I

*Armadillo bolivianus* Dollfus, 1897:1, Fig. 1.

*Cubaris boliviana* (Dollfus, 1897). VAN NAME, 1936:335, Fig. 200.

*Venezillo bolivianus* (Dollfus, 1897). ARCANGELI, 1956:14.

DIAGNOSIS. Eyed. Dorsum smooth. Underedge of pereon I with relatively deep notch running its length. Underedges of pereons II and III each with deep notch.

DESCRIPTION. About 13 ocelli. Body with smooth dorsum about 2.9 times as long as broad. Color redish brown. Epistome of cephalon turned up as a more or less sharp, transverse ridge. Two flagellar articles subequal in length. Underedge of pereon I with groove along entire length. Pleotelson hourglass shaped with posterior edge only slightly wider than medial width. Basis with square posterior margin with tiny exopod arising from corner of hourglass shaped pleotelson.

Measurements. 8 mm long (DOLLFUS). 6 mm male described here.

TYPE LOCALITY. “Mission de S. Francisco, Haut Pilcomayo (Bolivie)”, Bolivia (first named locality).

DISTRIBUTION. In addition to the type locality in Bolivia, the species was collected at two stations according to Dollfus - Mission de Aguairenda, Chaco Bolivia and Caiza, Chaco Bolivia. In Paraguay one non gravid female 6 mm long was collected at Amambay prov., 80 km S Bella Vista near Ao. Negla, sifting bamboo litter, 11.X.1979. It was collected not far from the new species of *Venezillo* described below.

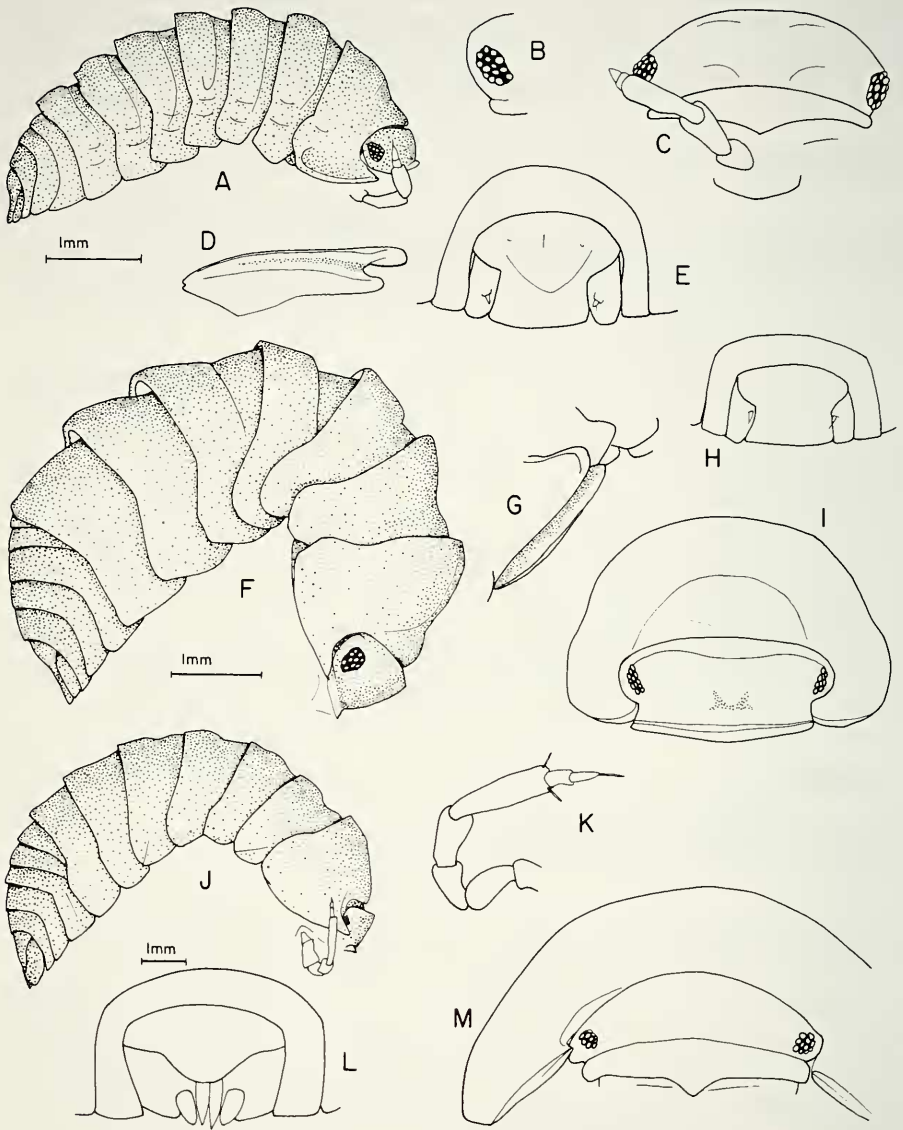


FIG. 12

*Venezillo bellavistanus* n. sp., female: A) lateral view; B) detail, ocelli; C) cephalon, frontal view; D) detail, underedge pereon I; E) pleotelson, posterior view; F) *Venezillo bolivianus* (Dollfus, 1897), male: G) detail, underedge pereon I; H) pleotelson, posterior view; I) frontal view; J) *Circoniscus bezzii* Arcangeli, 1931, female: K) detail, antenna 2; L) pleotelson, posterior view; M) frontal view.

Deposition of types unknown. Others: MHNG.

TAXONOMIC REMARKS. See "Taxonomic remarks" section for the new species description below.

REMARKS. VAN NAME (1936:335) repeated the description of Dollfus when he recorded the species as *Cubaris boliviana*. Because only one specimen was collected here, it was not dissected and described in detail.

***Venezillo bellavistanus* n. sp.**

Fig. 12A-E

DIAGNOSIS. Eyed. Dorsum with very low tubercles. Underedge of pereon I flattened with large square notch on posterior end, extending anteriorly as very shallow groove. Pereon II notched and III plain.

DESCRIPTION. About 14 ocelli. Dorsum with very low tubercles, about 2.3 times as long as broad. Color gray, marbled. Lateral margins of pereon I slightly flared with notch on posterior part of underedge and extending anteriorly as shallow groove. Underedge of pereon II notched, III plain. Pleotelson hourglass shaped with length of posterior margin only slightly longer than medial width. Basis with rounded posterior corners with tiny exopod arising angularly just below medial length of basis. Exopod of pleopod I of female, tiny.

Measurements. Female 4.6 mm long.

TYPE LOCALITY. The species was collected at Amambay prov., 12 km S Bella Vista, sifting forest litter, 23.X.1979: 1 female.

DISTRIBUTION. Known only from the type locality.

Deposition of type: MHNG.

TAXONOMIC REMARKS. The dorsum of the new species and *Venezillo bolivianus* is nearly smooth. *Venezillo bellavistanus* has a short notch on the underedge of pereon I when compared to the long groove on pereon I in *V. bolivianus*. The new species cannot be compared in more detail to other species of *Venezillo* until more specimens including males are collected.

REMARKS. No other species of *Venezillo* has the short notch on pereon I as illustrated.

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